WHAT IS CLAIMED IS:

1. An apparatus for ejecting droplets comprising:

a plurality of nozzles through which droplets are ejected;

a plurality of liquid containing chambers each connected at one longitudinal end thereof with a corresponding nozzle;

an actuator that changes a volume of each of the liquid containing chambers; and

an actuator controller that controls driving of the actuator,

wherein:

the actuator controller applies, in accordance with a one-dot printing instruction, to the actuator an ejection pulse signal that increases the volume of the liquid containing chamber to cause ejection of a droplet, and subsequently an additional pulse signal that increases the volume of the liquid containing chamber to pull back a part of the droplet about to be ejected; and

a pulse width of the ejection pulse signal is A times a time T required for a pressure wave to propagate in one way longitudinally through the liquid containing chamber, where A is a positive constant less than 1.

2. The apparatus according to claim 1, wherein a time interval between a completion of an application of the ejection pulse signal and a start of an application of the additional pulse signal is B times the time T, where B is a positive constant; and a total value of the constants A and B is 1.1 to 1.5.

3. The apparatus according to claim 2, wherein a pulse width of the additional pulse signal is C times the time T, where C is a constant within 0.4 to 0.5.

4. The apparatus according to claim 1, wherein the time T is 5 μsec or less.

5. The apparatus according to claim 1, wherein each of the liquid containing chambers includes a pressure chamber connected at one longitudinal end thereof with a corresponding nozzle and at the other end thereof with a ink supply source, a volume of the pressure chamber being changed by the actuator, and

wherein the liquid containing chamber is a space from an end portion of the ink supply source on the pressure chamber side, through the pressure chamber, to the nozzle.

6. The apparatus according to claim 1; wherein the

actuator controller stores plural waveform patterns of pulse signals being applied to the actuator in accordance with a volume of a droplet to be ejected upon a one-dot printing instruction, selects any one of the plural waveform patterns in accordance with a gradation value of each pixel included in image data, and, upon selection of a waveform pattern for a minute droplet out of the plural waveform patterns, applies the ejection pulse signal and subsequently the additional pulse signal to the actuator.

7. An actuator control device used in an apparatus for ejecting droplets, the apparatus comprising a plurality of nozzles through which droplets are ejected, a plurality of liquid containing chambers each connected at one longitudinal end thereof with a corresponding nozzle, and an actuator that changes a volume of each of the liquid containing chambers,

the actuator control device applying, in accordance with a one-dot printing instruction, to the actuator an ejection pulse signal that increases the volume of the liquid containing chamber to cause ejection of a droplet, and subsequently an additional pulse signal that increases the volume of the liquid containing chamber to pull back a part of the droplet about to be ejected; and

a pulse width of the ejection pulse signal being A

times a time T required for a pressure wave to propagate in one way longitudinally through the liquid containing chamber, where A is a positive constant less than 1.

8. The actuator control device according to claim 7, wherein a time interval between a completion of an application of the ejection pulse signal and a start of an application of the additional pulse signal is B times the time T, where B is a positive constant; and a total value of the constants A and B is 1.1 to 1.5.

9. The actuator control device according to claim 8, wherein a pulse width of the additional pulse signal is C times the time T, where C is a constant within 0.4 to 0.5.

10. The actuator control device according to claim 7, wherein the time T is 5 μsec or less.

11. The actuator control device according to claim 7, wherein each of the liquid containing chambers includes a pressure chamber connected at one longitudinal end thereof with a corresponding nozzle and at the other end thereof with a ink supply source, a volume of the pressure chamber being changed by the actuator, and

wherein the liquid containing chamber is a space from

an end portion of the ink supply source on the pressure chamber side , through the pressure chamber, to the nozzle.

12. The actuator control device according to claim 7; wherein the device stores plural waveform patterns of pulse signals being applied to the actuator in accordance with a volume of a droplet to be ejected upon a one-dot printing instruction, selects any one of the plural waveform patterns in accordance with a gradation value of each pixel included in image data, and, upon selection of a waveform pattern for a minute droplet out of the plural waveform patterns, applies the ejection pulse signal and subsequently the additional pulse signal to the actuator.

13. An actuator control device comprising:

a print data memory that stores a gradation value of each pixel included in image data;

a waveform memory that stores plural waveform patterns of pulse signals that correspond to different volumes of a droplet to be ejected upon a one-dot printing instruction;

a droplet volume determining portion that determines, with respect to each pixel, a volume of a droplet to be ejected from a nozzle, on the basis of the gradation value stored in the print data memory; and

a pulse generator that generates a pulse signal to be applied to an actuator that changes a volume of a liquid containing chamber on the basis of any one of the plural waveform patterns corresponding to the volume of a droplet determined by the droplet volume determining portion,

wherein one of the plural waveform patterns stored in the waveform memory includes:

an ejection pulse signal that increases the volume of the liquid containing chamber to cause ejection of a droplet and has a pulse width of A times a time T required for a pressure wave to propagate in one way longitudinally through the liquid containing chamber, where A is a positive constant less than 1; and

an additional pulse signal to be applied following the ejection pulse, the additional pulse signal increasing the volume of the liquid containing chamber to pull back a part of the droplet about to be ejected.

14. The actuator control device according to claim 13, wherein the pulse generator generates, when a smallest volume of a droplet is determined by the droplet volume determining portion, the ejection pulse signal and the additional pulse signal on the basis of one of the waveform patterns corresponding to the smallest volume.

15. A method for controlling an actuator in an apparatus for ejecting droplets, the apparatus comprising a plurality of nozzles through which droplets are ejected, a plurality of liquid containing chambers each connected at one longitudinal end thereof with a corresponding nozzle, and an actuator that changes a volume of each of the liquid containing chambers,

the method comprising, with respect to a one-dot printing instruction, the steps of:

applying to the actuator an ejection pulse signal having a pulse width of A times a time T required for a pressure wave to propagate in one way longitudinally through the liquid containing chamber, where A is a positive constant less than 1, the ejection pulse signal increasing the volume of the liquid containing chamber to cause ejection of a droplet; and

applying to the actuator an additional pulse signal after the application of the ejection pulse signal, the additional pulse increasing the volume of the liquid containing chamber to pull back a part of the droplet about to be ejected.

16. The method according to claim 15, wherein a time interval between a completion of an application of the ejection pulse signal and a start of an application of the

additional pulse signal is B times the time T, where B is a positive constant; and a total value of the constants A and B is 1.1 to 1.5.

17. The method according to claim 15, wherein a pulse width of the additional pulse signal is C times the time T, where C is a constant within 0.4 to 0.5.

18. The method according to claim 15, wherein the time T is 5 μsec or less.